

CLAIMS

WHAT IS CLAIMED IS:

1. A rotating fan made of a first material having a hub through which a gas containing solid particles is drawn, the gas and solid particles being projected out the circumference of the fan along channels formed by fan blades, the channels being lined with a labyrinth seal comprised of plates of a second material harder than the first material.

2. The rotating fan of Claim 1 wherein said labyrinth seal further comprises an additional layer of tiles securely attached along at least one joint of the channel.

3. A method for forming a protective labyrinth seal on at least some exposed areas of a rotating fan having a hub, sides and at least one fan blade, the method comprising:

a) securing plates comprised of a hardened material to at least one face of each fan blade;

b) affixing an additional layer of tiles of the hardened material having a face length, a side width, and an edge depth along at least one intersection of the fan side and the fan blade such that:

a first face of a first tile is adjacent to the fan side and a first edge of the first tile is adjacent to the plates on the face of the fan blade;

a first face of a second tile is adjacent to the plates on the face of the fan blade, a first edge of the second tile is adjacent to the side of the fan blade, and a portion of a first side of the second tile is adjacent to a first side of the first tile;

a first face of a third tile is adjacent to the plates on the face of the fan blade, a first edge of the third tile is adjacent to a second face of the first tile, and a portion of a first side of the third tile is adjacent to the first side of the second tile;

a first face of a fourth tile is adjacent to the side of the fan, a first edge of the fourth tile is adjacent to a second face of the second tile, and a portion of a first side of the fourth tile is adjacent to a first side of the first tile; and

c) alternating the above configuration along the entire intersection of the fan side and the fan blade.

4. The method of Claim 3 wherein the plates and tiles are composed of a metal carbide.

5. The method of Claim 3 wherein the plates and tiles are composed of a ceramic material.

6. The method of Claim 3 further comprising securing the plates and tiles to the fan by means of an adhesive substance.

7. The method of Claim 3 further comprising securing the plates and tiles to the fan by means of brazing.

8. The method of Claim 3 further comprising securing a substrate between the fan blade and the plates.

9. The method of Claim 8 further comprising securing the plates to the substrate and the substrate to the fan blade by means of an adhesive substance.

10. The method of Claim 8 further comprising securing the plates to the substrate and the substrate to the fan blade by means of brazing.

11. The method of Claim 3 further comprising sealing along
5 all exposed edges of the tiles and plates adjoining the fan blade and fan side.

12. The method of Claim 3 wherein all tiles are of approximately a same length.

13. The method of Claim 3 wherein the length of the third
10 and fourth tiles is shorter than the length of the first and second tiles by an amount approximately equal to a thickness of the tiles so that the edges of the tiles projecting out from the joint are of approximately a same height.

14. An apparatus for protecting at least one surface of a
15 rotating fan having a hub, sides and at least one fan blade, the apparatus comprising:

a) plates comprised of a hardened material secured to at least a face of each fan blade;

b) a layer of tile comprised of the hardened material
20 secured to an intersection of the fan side and the fan blade, each tile having a face length, a side width and an edge depth secured to the fan, the tile arranged such that:

a first tile is secured to the fan with a first face adjacent to the side of the fan and a first edge adjacent
25 to the plates on the face of the fan blade;

a second tile is secured to the fan with a first face adjacent to the plates on the face of the fan blade, a first edge adjacent to the side of the fan blade, and a

portion of a first side of the second tile adjacent to a first side of the first tile;

5 a third tile is secured to the fan with a first face adjacent to the plates on the face of the fan blade, a first edge adjacent to a second face of the first tile, and a portion of a first side of the tile adjacent to the first side of the second tile;

10 a fourth tile is secured to the fan with a first face adjacent to the side of the fan, a first edge adjacent to a second face of the second tile, and a portion of the first side of the tile adjacent to the first side of the first tile; and

15 c) tiles configured in accordance with step b secured along the entire length of the joint of the fan blade and fan side.

15. The apparatus of Claim 14 wherein all tiles are of approximately a same length.

20 16. The apparatus of Claim 14 wherein the length of the third and fourth tiles is shorter than the length of the first and second tiles by an amount approximately equal to a thickness of the tiles so that the edges of the tiles projecting out from the joint are of approximately a same height.

25 17. The apparatus of Claim 14 wherein the pieces of hardened material are secured to the assembly by means of an adhesive substance.

18. The apparatus of Claim 14 wherein the pieces of hardened material are secured to the assembly by means of brazing.

19. The apparatus of Claim 14 further comprising a substrate between the assembly and the plates of hardened material.

20. The apparatus of Claim 19 wherein the plates of
5 hardened material are secured to the substrate, and the substrate to the assembly by means of an adhesive substance.

21. The apparatus of Claim 19 wherein the plates of hardened material are secured to the substrate, and the substrate to the assembly by means of brazing.

10 22. The apparatus of Claim 14 wherein all exposed edges of the tiles and plates adjoining the fan blade and fan sides are sealed.